

IN THE CLAIMS

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1. In a transfer device useable in a system for intraluminal treatment of a selected site in a body of a patient by at least one treating element advanced through a lumen in the transfer device into a lumen of a separate catheter by means of pressurized fluid, the catheter having a proximal end with a connector integral therewith for attaching the catheter to the transfer device, the improvement comprising:

10 an actuator assembly including a gate member movable between a first position that prevents the treating element from entering the lumen of the catheter and a second position that permits the treating element to enter the lumen of the catheter, said gate member being movable into said second position only if the catheter is attached to the transfer device.

20 2. The transfer device of Claim 1 further comprising a central opening for receipt of the connector and said actuator assembly further comprising a movable switch member biased into a first position that interferes with the movement of said gate member into said second position and movable to a second position upon the connector being received in said central opening of the transfer device, thereby allowing said gate member to be moved into said second position.

25 3. The transfer device of Claim 2 wherein said moveable switch member lockingly engages the connector when said moveable switch is in said second position.

30 4. The transfer device of Claim 3 wherein a portion of said actuator assembly prevents said switch member from disengaging the connector when in said second position.

5. The transfer device of Claim 3 further comprising a release button for disengaging said switch member from the connector to permit the catheter to be disconnected from the transfer device, said release button being operable only when
5 said gate is in said first position.

10. The transfer device of Claim 2 in which said actuator assembly further comprises a movable trigger member biased to interfere with the receipt of the connector into said central opening, said switch member being movable into locking engagement with the connector when the connector is received in said central opening, and a release button for disengaging said trigger from the connector to permit the catheter to be disconnected from the transfer device.
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20. The transfer device of Claim 1 in which said gate member further comprises a body portion defining a hole sized to allow the treating element to pass therethrough when said gate member is in said second position.
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25. The transfer device of Claim 1 in which said gate member comprises an elongated pin having a diameter less than the diameter of the transfer device lumen, said pin intersecting the transfer device lumen to partially obstruct the transfer device lumen when said gate member is in said first position and said pin retracted from intersecting the transfer device lumen when said gate member is in said second position.
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30. The transfer device of Claim 6 wherein said switch member moves into locking engagement with the connector when said gate member is moved into said second position, said switch member blocking said gate member from movement into said second position unless the connector is received in said central opening of the transfer device.
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10. The transfer device of Claim 6 wherein access to said release button is blocked when said gate member is in said second position.

5 11. The transfer device of Claim 1 in which said actuator assembly further comprises a moveable latch member having a U-shaped opening for engaging a relieved portion on the connector when the catheter is attached to the transfer device.

10 12. The transfer device of Claim 8 wherein said pin is biased to intersect the transfer device lumen with a force insufficient to damage the treating element if the treating element is contacted by said pin.

15 13. The transfer device of Claim 1, the improvement further comprising:

20 a cylindrical fluid control switch sized to fit within a central bore in the transfer device and having a plurality of fluid channels defined by areas of enlarged diameter on said cylindrical fluid control switch, whereby pressurized fluid is selectively introduced into the lumen in the transfer device by rotation of said fluid control switch.

25 14. In a transfer device useable in a system for intraluminal treatment of a selected site in a body of a patient by at least one treating element advanced from the transfer device into a lumen of a catheter by means of pressurized fluid, the transfer device being in communication with a source of pressurized fluid, the improvement comprising:

30 a pressure indicator including a transparent elongated cylinder having a first portion of a first inside diameter and viewable by a user of the transfer device, a piston slidably received within said cylinder and sized to sealingly engage said first portion, said piston being biased into said first

portion of said cylinder, an inlet port in said first portion in communication with the source of pressurized fluid, whereby the relative position of said piston in said first portion of said cylinder provides a visual indication of the relative fluid pressure.

15. The transfer device of Claim 14 wherein the elongated cylinder of said pressure indicator further comprises a second portion having a second portion having a second inside diameter larger than said first inside diameter, an outlet port in said portion in communication with the exterior of the transfer device, and said piston is biased into said first portion of said cylinder so that when the force of the pressurized fluid on said piston exceeds a predetermined force, said piston is moved into said second portion of said cylinder to allow the pressurized fluid to flow past said piston and through said outlet.

20. 16. The transfer device of Claim 15 wherein said pressure indicator further comprises a spring to bias said piston into said first portion of said cylinder, said spring having a spring constant selected so that said spring exerts said predetermined force on said piston.

25. 17. The pressure indicator of Claim 14 wherein said transparent cylinder includes graduation markings to provide an observable indication of the relative position of said piston within said cylinder.

30. 18. The transfer device of Claim 14 further comprising a pressure relief valve connected in parallel fluid communication with said pressure indicator.

35. 19. In a catheter having a proximal end and a distal end useable in a system for intraluminal treatment of a selected

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site in a body of a patient including a transfer device having a central opening for receiving the catheter and for storing at least one treatment element and propelling the treatment element into a lumen in the catheter, the improvement comprising:

5 a connector integral with the proximal end of the catheter including at least one detent for securing said connector in the central opening of the transfer device, said detent being manually actuatable to release the catheter from central opening of the transfer device.

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10 20. The catheter of Claim 18 wherein said detent comprises a cantilever arm axially extending from said connector.

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15 21. A catheter for use in a system for intraluminal treatment of a selected site in a body of a patient by at least one treating element moveable by means of pressurized fluid, the catheter comprising an elongated tube having a proximal end and a distal end, first and second lumens extending between said proximal and distal ends and communicating at said distal ends, said first lumen sized to slidably receive the treating element, and said second lumen having an elliptical cross section.

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25 22. The catheter of Claim 21 further comprising at least one radiopaque marker for aligning said distal end and the at least one treating element with the selected site of the body of a patient, said radiopaque marker being located within said first lumen at said distal end.

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30 35 23. In a system used for the intraluminal treatment of a selected site in the body including a catheter adapted for intraluminal positioning in the body and a transfer device external to the body for storing the treating elements and

introducing the treating elements into the catheter, a method for detecting whether treating elements reside within the transfer device comprising:

5 encapsulating the treating elements in a material having known reflectivity characteristics;

 shining first and second lights of different wavelengths into an area in the transfer device where the treating elements are stored before and after being introduced into the catheter;

10 measuring the intensities of the first and second lights reflected off of the area in the transfer device;

 determining the reflected intensity ratio of the reflected first and second lights;

15 comparing the reflected intensity ratio of the reflected first and second lights with the known reflectivity characteristics of the encapsulating material for the treating elements; and

20 indicating whether the measured reflected intensity ratio is substantially the same as the known reflectivity characteristics.

24. The method of Claim 23 wherein said first and second lights are flashed in turn onto an area of the transfer device where the treating elements are stored.

25 25. The method of Claim 23 further comprising:

 assembling said treating elements in a linear array, said treating elements being encapsulated in stainless steel;

30 placing a marker element at at least one end of said linear array of treating elements, said marker element being encapsulated in gold; and

 shining said first and second lights onto the area in the transfer device where the marker seed is stored before and after the treating elements are introduced into the

catheter, said first light being blue and said second light being red.

5 26. The method of Claim 23 further comprising activating a light of a first color visable exterior to the transfer device when the measured reflected intensity ratio is substantially the same as the known reflectivity characteristics; and

10 activating a light of a second color visable exterior to the transfer device when the measured reflected intensity ratio is not substantially the same as the known reflectivity characteristics.

15 27. The method of Claim 23 further comprising:
 creating signals corresponding to the reflected intensities of the lights reflected off the area in the transfer device;

20 filtering out any signals created by reflected ambient light; and

 comparing the signals created by said first and second reflected lights to signals corresponding to the known ratio of the reflectivities of the encapsulating material at different wavelengths for said first and second lights.

25 28. The method of Claim 25 further comprising:
 creating signals corresponding to the reflected intensities of the lights reflected off the area in the transfer device;

30 filtering out any signals created by ambient light;
 and

 comparing the signals created by said first and second reflected lights to signals corresponding to the known reflectivities of the encapsulating material at different wavelengths.

29. The method of Claim 28 further comprising:
creating a signal having a null output voltage for
the lights reflected off said marker element.

5 30. The method of Claim 29 wherein said null output
voltage for the lights reflected off said marker element is
created by adjusting the light intensities.

10 31. A system for determining the presence or absence of
an element at a targeted location, the element having known
reflectances for lights of different wavelengths, the system
comprising:

15 a power source;
a first light source optically connected to the
targeted location for emitting a light having a first
wavelength;

20 a second light source optically connected to the
targeted location for emitting a light having a second
wavelength;

25 a first photosensor optically connected to the
targeted location for measuring the light reflected off the
targeted location and creating a signal corresponding thereto;

30 a window detector for determining whether said
created signal is within a predetermined band corresponding to
a signal which would be created by light of first and second
wavelengths being reflected off the element; and

35 at least one indicator light that is activated if
said created signal is within said predetermined band.

32. The system of Claim 31 wherein each of said first
and second light sources comprises an LED.

33. The system of Claim 32 wherein said first light
source comprises a blue LED and said second light source
comprises a red LED.

34. The system of Claim 32 wherein said first photosensor comprises a photo diode, a graded refractive index lens for collecting light reflected off the target area and directing the collected light to said photo diode, and an amplifier integrated with said photo diode.

35. The system of claim 32 further comprising a brightness control circuit for holding constant the output of at least one LED, said brightness control circuit comprising:

a second photosensor optically connected to said LED;

a synchronous detector and filter for receiving the output of said second photosensor; and

an amplifier and an integrator to receive the output of said second photosensor and for setting a control loop gain to be added to a reference signal that sets a drive range for said LED.

36. The system of Claim 31 further comprising a filter for removing signals generated by said first photosensor due to ambient light.

37. The system of Claim 36 wherein said filter comprises a synchronous detector synchronized with signals corresponding to light of said first and second wavelengths and for removing all unsynchronized signals.

38. A catheter for use in a system for intraluminal treatment of a selected site in a body of a patient by at least one treating element moveable by means of pressurized fluid, the catheter comprising an elongated tube having a proximal end and a distal end, and first, second and third lumens extending between said proximal and distal ends, said first lumen sized to slidably receive the treating element, and said third lumen sized to receive a guidewire, the distal end

of said third lumen having a lining that resists damage from the guidewire as said catheter is delivered over the guidewire to the selected site.

5 *Perry* 39. The catheter of Claim 38 wherein said lining comprises a high density/low density polyethylene.

10 *Seth* 40. A catheter for use in a system for intraluminal treatment of a selected site in a body of a patient by at least one radioactive treating element moveable by means of pressurized fluid, the catheter comprising a shield tube fitted over a portion of the proximal end of said catheter for protection from the radioactive treating elements when transferred into and out of said catheter.

15 *Sub D* 41. In combination with at least one treating element usable in a system for intraluminal treatment of a selected site in a body of a patient, the treating element being stored in the transfer device and advanced from the transfer device into the catheter by means of a pressurized fluid, the improvement comprising at least one marker element positioned on either end of the treating element, said marker element having at least one slotted end portion.